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(54) **Sliding battery post seal**

(57) A simplified seal means for a lead acid battery includes a downwardly depending sleeve member 50 integral with a cover member, and a sliding member 44 including an insert member 42 with an aperture for receiving a battery terminal or post, molded into the sliding member, which is closely sealingly slidably received in the sleeve member, to form a simple sliding seal between the sliding member and the cover member. Preferably, the sleeve member includes a thin flexible portion at its lower end, and having a terminal portion which is sealingly affixed to the lower end of the sliding member, such as by ultrasonic welding, to maintain a positive seal between the cover member and the sliding member as the battery post moves upward due to increase in size of battery plates with use.

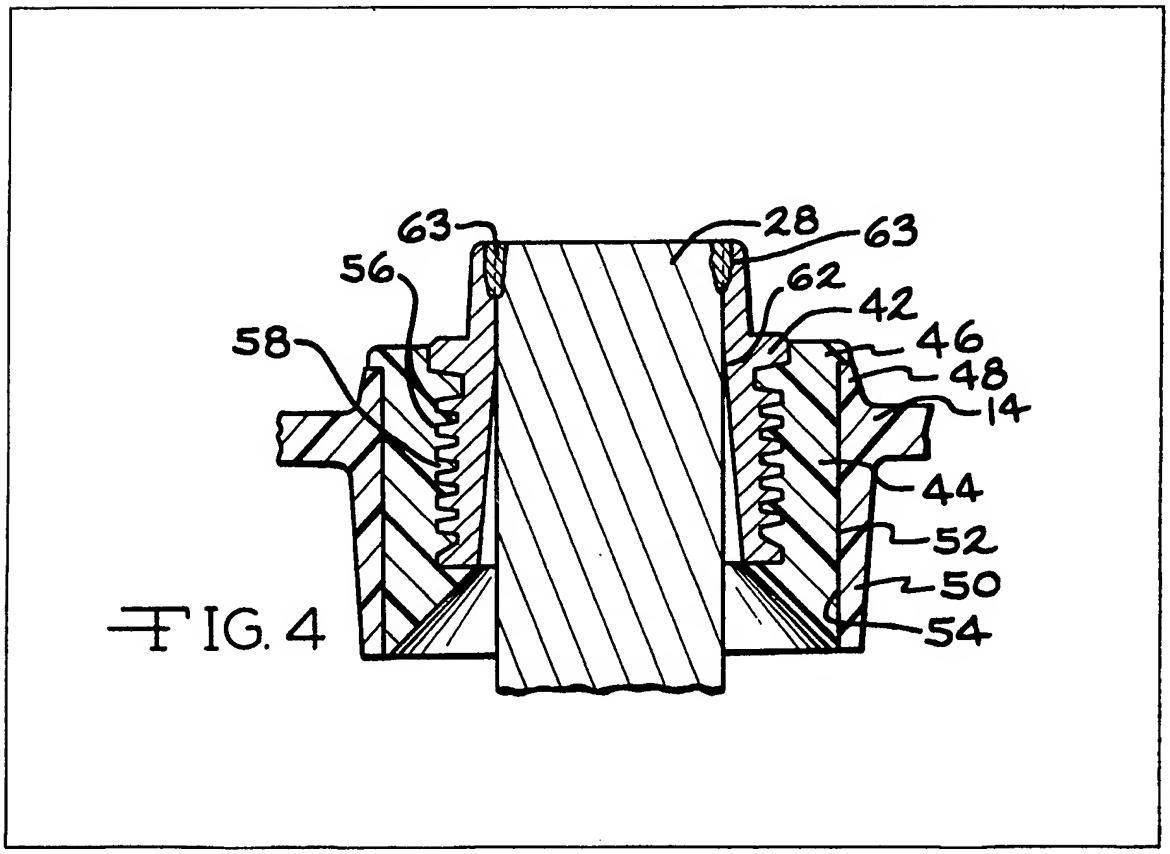


FIG. 4

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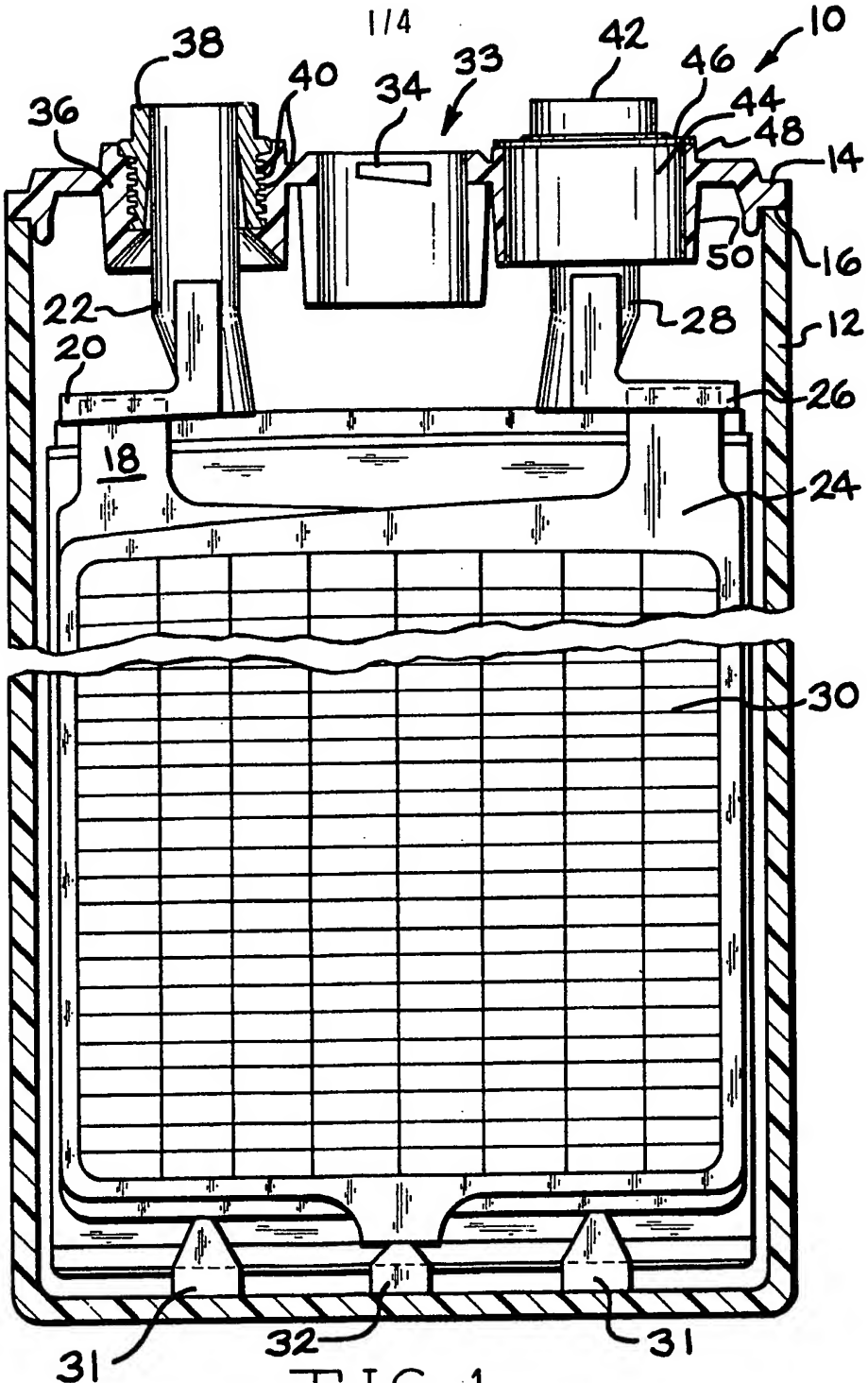


FIG. 1

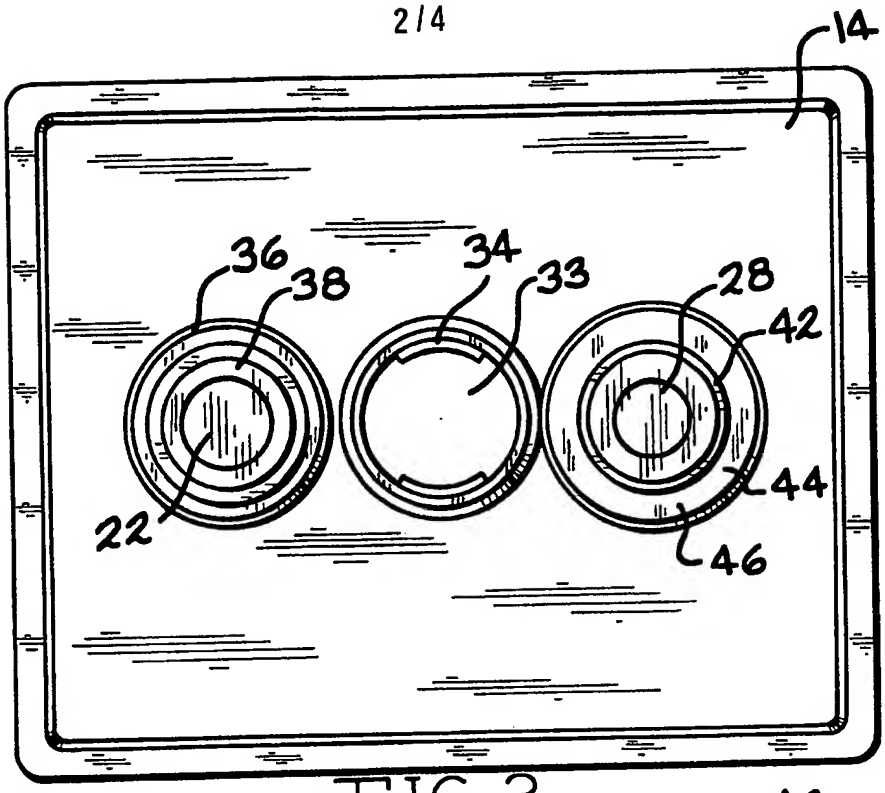
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FIG. 2

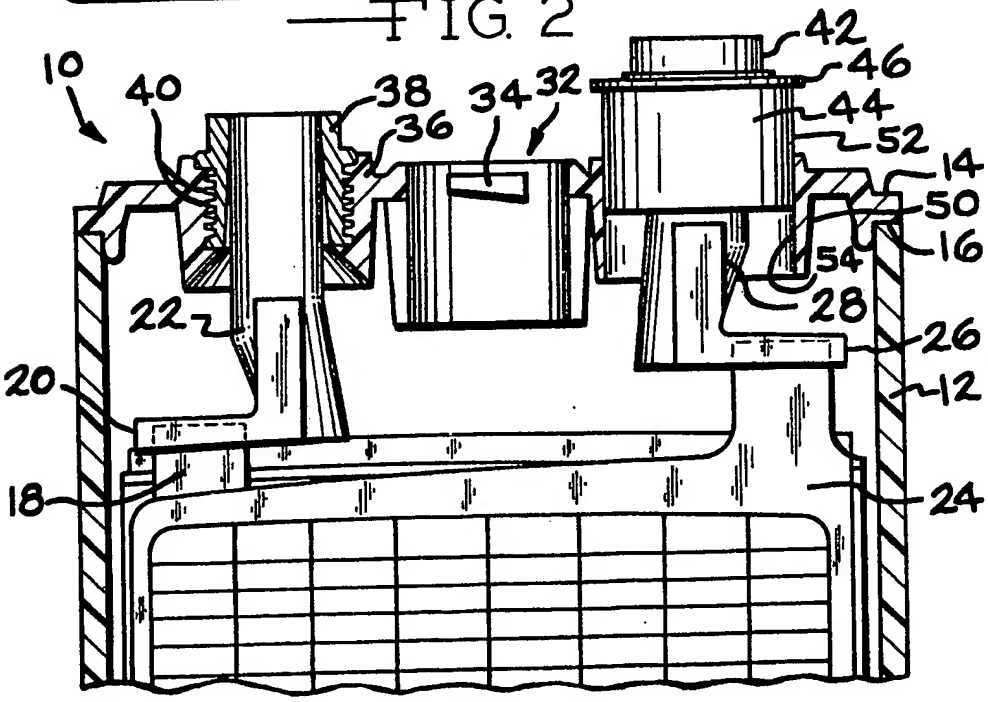
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FIG. 3

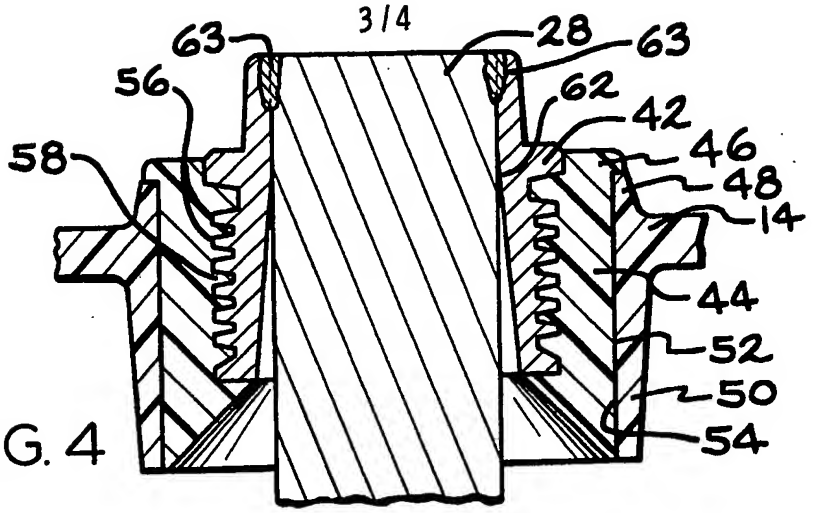


FIG. 4

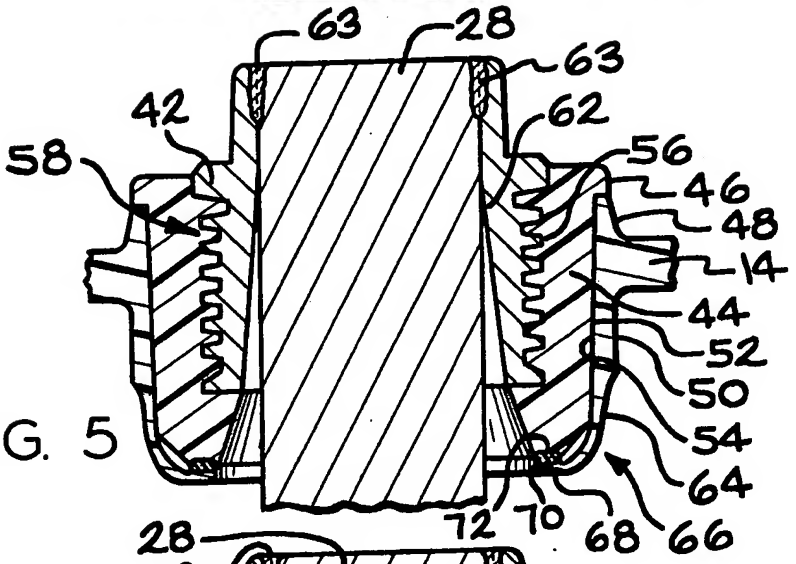


FIG. 5

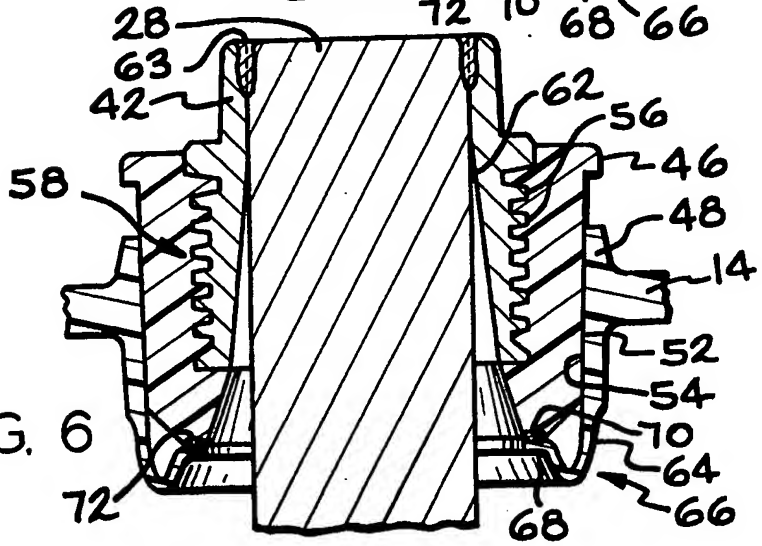


FIG. 6

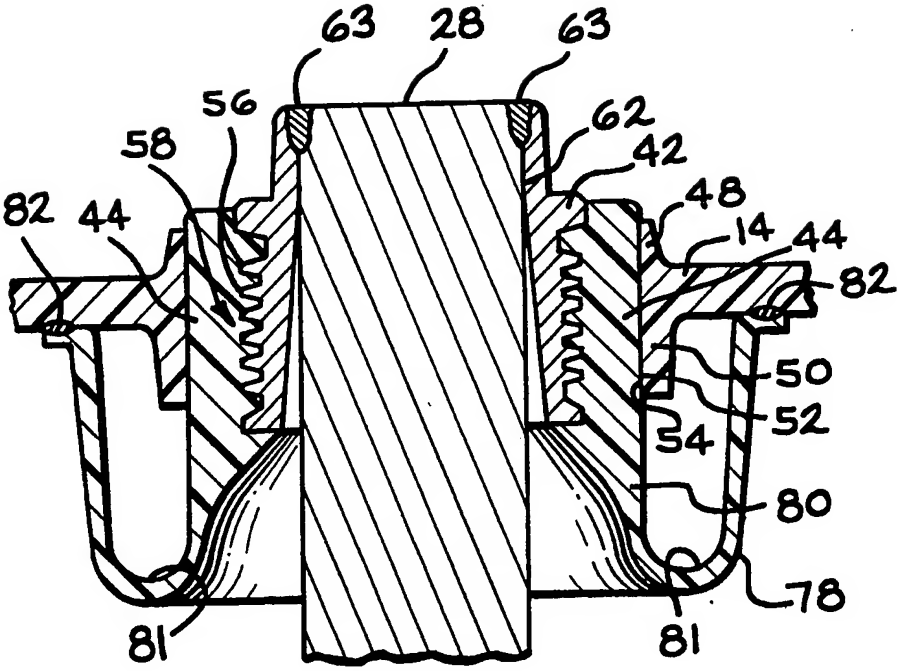


FIG. 7

SPECIFICATION

**Sliding battery post seal**

*Background of the invention*

This invention relates to storage batteries, and, in particular, means used to effect a fluid seal between the battery terminals or posts and the battery case.

Conventional lead acid storage batteries include two battery posts, an anode or positive terminal or post, and a cathode or negative terminal or post, extending through the cover. Anode or positive battery plates are connected in parallel to the anode or positive battery terminal, and the cathode or negative plates are likewise connected to the cathode or negative terminal. The plates themselves are in the form of a gridwork, covered with an active material.

As is well-known, in use, positive or anode plates or electrodes become larger, due to the gradual accumulation of a lead-oxide deposit within the positive plate. This deposit is larger than the original material, and causes the plate to swell and buckle. In many batteries, designed for a short lifetime, the effect of this increase in size is not serious, since the buckling which takes places is not the limitation on battery life. However, upon the repeated charging which occurs with a battery of the so-called cycling type, which is used for load leveling applications, motive power applications, and the like, which have a considerably longer intended life, the amount of positive plate growth becomes serious, and causes the cell cover to be pushed outwardly. This presents no problem when the cover is sealed to the jar with flexible sealing material such as a bituminous compound. However, when it is desired to produce a fixed, nonflexible sealing of the cover to the jar, such as by heat sealing, the vertical outward expansion force could become damaging to the battery element, and eventually cause failure of the battery cell.

One solution to this problem is disclosed in United States Patent 4,164,609, issued August 14, 1979. There, a first stuffing box is located around the battery post, which includes an O-ring and a fitting gland screwed into the stuffing box for squeezing the O-ring to seal the stuffing box to the battery post, and a second stuffing box is formed integrally with the battery case, and sealed to the first stuffing box with a second O-ring, movement of the battery post with respect to the battery case being accommodated by movement between the two stuffing boxes. As will be apparent, this is a complex structure, with multiple seals capable of failure, and several pieces which must be manually installed to effect the seal, with a danger of dropping one of the pieces into the interior of the battery.

Also, as is known, as the battery ages, the battery post sustains various changes. The surface of the post within the cell or battery becomes eroded and a reduction in size of its outer periphery occurs. In the conventional method of providing a sliding seal between a battery terminal and case, this erosion undercuts sealing devices or materials. The result of this undercutting is a loss in area or volume of the original seal, and a reduction of its barrier effect over the life of the cell or battery.

The instant invention overcomes these and other deficiencies of the prior art.

*Summary of the invention*

In accordance with the invention, a sleeve member is made integral with the cover member, defining the inner periphery of the aperture through which the positive post passes, the sleeve member preferably being molded along with the cover member, of the same material. An insert member, made of lead or a lead alloy is molded into a sliding member, which has an outer surface which is closely received within the sleeve member, to form a sliding seal. The insert member has an aperture therethrough for receiving the terminal post, the terminal post being welded to the insert member after the sliding member has been inserted in the sleeve member. The outer surface of the sliding member and the inner surface of the sleeve member are both smooth, and immune to the electrolyte of the battery, as well as resisting the adherence of dirt or contamination. A suitable material for the cover member, the jar, the sleeve member and the sliding member is polypropylene.

Preferably, although the sliding member itself is capable of maintaining an adequate seal, preferably in conjunction with conventional sealing aids, either the sleeve member may be provided with a thin and more flexible portion, which has a terminal portion firmly affixed such as to the lower end of the sliding member, such as by ultrasonic welding or the sliding member may be provided with a thin and more flexible portion which is firmly affixed to the interior of the battery cover. Thus, a positive seal is maintained as the sliding member is moved outwardly.

The present invention has for its principal object to provide a sliding seal to allow growth of positive plates or electrodes without damage to the battery which is not dependent on the nature of the posts, and which is simple and uncomplicated to manufacture and assemble.

*Brief description of the drawings*

*Figure 1* is a side elevational view, partially in section, of a battery provided with seal means according to a first embodiment of the invention.

*Figure 2* is a top plan view of the battery of Figure 1.

*Figure 3* is a partial side elevational view, partly in section, showing the position of a sliding member according to the invention after positive plate or electrode growth.

*Figure 4* is a partial elevational view, in section, showing a sliding seal according to the first embodiment of the invention as shown in Figures 1 and 3.

*Figure 5* is a partial sectional view showing a sliding seal according to a second and preferred embodiment of the invention, in original position.

*Figure 6* is an illustration of the sliding seal of Figure 5 following upward movement of the battery post due to plate growth.

*Figure 7* is a partial sectional view showing a sliding seal according to a third and alternatively preferred embodiment of the invention.

*Detailed description of the invention*

As shown in Figure 1, a battery 10 includes a jar 12, and a cover member 14, rigidly joined at a joint 16. Battery 10 includes a plurality of negative plates or electrodes 18, each of plates 18 being connected to a header 20 which includes a battery post 22. Positive electrodes or plates 24 are connected to a header 26 which includes a battery post 28. As shown, plates such as plates 18 and 24 have a grid structure 30, and are supported by support means at the lower extent of jar 12. Specifically, support means 31 support positive plates 24, while support means 32 support negative plates 18.

Cover member 14 includes a filling aperture 33, which may be provided with a protrusion 34 to cooperate with a cap member in a breech-lock fashion. Any suitable conventional cap member may be used.

Cover member 14 includes a thickened portion 36, which is molded around an insert member 38. Insert member 38 is preferably of lead or a lead alloy, and includes corrugations 40, which may be in the form of a series of circumferential grooves, as shown, or may be knurling or serration, for maintaining thickened portion 36 and insert portion 38 in assembled relationship.

Battery post 28 is shown connected to an insert member 42, which is contained in a sliding member 44, shown as including a flange portion 46 disposed adjacent an upper end 48 of a sleeve member 50, shown as formed integrally with cover member 14 and defining an aperture therethrough.

Figure 2 is a top plan view of the single-cell battery shown in Figure 1, and illustrates in greater detail the relationship between negative post 22, thickened portion 36 and insert member 38, and of positive post 28, insert member 42, and sliding member 44 with flange portion 46.

Turning now to Figure 3, a partial view of the battery shown in Figure 1 is shown after positive plate growth has occurred. As shown, positive battery post 28 has moved upwardly, outer surface 52 of sliding member 44 being displaced from inner periphery 54 of sleeve member 50. As will be apparent, the smoothness of the materials used, together with the close fit between outer surface 52 and inner periphery 54 may provide an adequate seal for battery 10 in this condition. If desired, conventional aids to sealing may be applied to surface 52 and periphery 54. Such conventional aids include silicone grease, bituminous compounds, motor oil, hot-melt glue, and non-hardening sealing compounds such as is used to coat gaskets in oil and water distribution systems in automobile engines.

Figure 4 is a detailed sectional view of the sealing means shown in Figures 1 and 3. As shown, insert member 42 includes corrugations 56 which, as with corrugations 40, shown in Figure 1, may be circumferential grooves, knurling, serration or the like, for defining an inner surface 58 which conforms to the corrugated portion defined by corrugations 56. As shown, outer surface 52 is adapted to be closely sealingly slidably received within inner periphery 54 of sleeve member 50. A flange portion 46 is shown cooperating with an upper end 48 of sleeve member 50, to prevent pressure applied to post or terminal 28 from forcing sliding member 44 in an inward direction, and also facilitating the assembly of the seal means according to the invention. As will be apparent, sliding member 44 is molded around insert 42, and this assembly of insert 42 and sliding member 44 is placed within sleeve member 50 of cover member 14. As cover member 14 is placed on jar 12, post 28 will protrude through aperture 62 in insert 42, and will be welded, such as by gas welding at area 63, to insert 42, forming an electrical junction therebetween.

Referring now to Figure 5, a second and preferred embodiment of the invention is shown, which maintains an even more positive seal during positive plate growth. As shown in Figure 5, sleeve member 50 includes a thin flexible portion 64, integral with sleeve member 50 and shown at a lower or inner end 66 of sleeve member 50. As shown, a terminal portion 68 is fastened, such as by ultrasonically welding, at joining portion 70, to a lower or inner end 72 of sliding member 44.

As will be apparent, in this preferred embodiment, sliding member 44 will be installed within inner periphery 54 of sleeve member 50 before cover member 14 is fastened to jar 12, so that a conventional ultrasonic welding horn may be used to join portion 68 of sleeve member 50 of cover 14 to sliding member 44. Thereafter, as described in connection with Figure 4, as cover 14 is installed on jar 12, post 28 will protrude through aperture 62, and will be welded as at 64 to insert member 42.

Figure 6 illustrates the second preferred embodiment of Figure 5 following growth of positive plates, and outward motion of battery post 28. As shown, flange 46 has moved away from upper end 48, and lower end 66 has assumed a concave-convex shape, flexing while maintaining seal integrity at joining portion 70.

Referring now to Figure 7, there is shown a third and alternatively preferable embodiment of the invention, which is generally a mirror-image of the embodiment of Figure 5, where a thin flexible portion is integral with the sliding member, and fastened to the cover. Because of this similarity, identical reference numerals will be used wherever appropriate.

As shown in Figure 7, a thin flexible portion 78 is made integral with lower or inner portion 80 and folded back upon itself defining a bight 81, to be joined to cover member 14, such as by ultrasonic welding, at joining portion 82. As will be apparent, thin flexible portion 78 may be made integral with sliding member 44 at any convenient portion, which need not be a lower or inner portion such as the illustrated portion 80. Also, joining portion 82 of cover member 14 may be located on sleeve member 50 of cover member 14, or in any other convenient place. With outward movement of battery post 28, sleeve member 44 will move outwardly, but thin flexible portion 42, firmly bonded at joining portion 82, will maintain positive seal integrity.

Therefore, the invention provides simple and effective sealing means around a positive post of a lead acid battery, to allow the post to move upward

without breaking the seal of the battery when positive plates become larger due to use, making maximum use of common and available parts, and facilitating the assembly of a battery.

Numerous modifications of the invention will be obvious to one skilled in the art. For instance, a temporary and breakable seal may be made between the lower ends of sliding member 44 and sleeve member 50, as shown in Figure 4, or, as will be apparent from Figures 5 and 6, such a temporary seal may be made to a stiff inward protrusion similar to lower end 66, which is broken by upward movement of post 28. A thin flexible portion of the cover member such as portion 64 may be fastened to any convenient point on a sliding member, such as at the outer end, or at an intermediate point. These and other modifications of the invention will be obvious to one skilled in the art, and may easily be made without departing from the spirit and scope of the invention.

CLAIMS

1. An electric storage battery having a cover and a terminal post which extends outwardly through an aperture in the cover, including sealing means for permitting relative movement of said terminal post outwardly through said aperture, said sealing means comprising:

a sleeve member defining an inner periphery of said aperture, said sleeve member being integral with said cover member;

an insert member having an aperture therethrough for receiving said terminal post therethrough, said insert member having an outer end and an inner end, said terminal post being welded to said insert member at said outer end of said insert member;

said insert member having an outer periphery portion, said outer periphery portion being a corrugated portion;

a generally tubular sliding member, said sliding member having an inner surface, an outer surface, an outer end and an inner end, said sliding member being a molded member molded around said insert member and having at least a portion of said inner surface conforming to said corrugated portion, said outer surface being adapted to be closely sealingly slidably received within said sleeve member defining said inner periphery of said aperture.

2. An electric storage battery according to claim 1, wherein:

said sleeve member includes a thin flexible portion integral with said sleeve member, said thin flexible portion having a terminal portion firmly and sealingly affixed to said sliding member.

3. An electric storage battery according to claim 2, wherein:

said sleeve member includes said thin flexible portion at an inner end of said sleeve member;

said terminal portion being firmly and sealingly affixed to said inner end of said sliding member.

4. An electric storage battery according to claim 3, wherein:

said thin flexible portion is ultrasonically welded to said inner end of said sliding member.

5. An electric storage battery according to claim 1, wherein:

said sliding member includes a thin flexible portion integral with said sliding member, said thin flexible portion having a terminal portion firmly and sealingly affixed to said cover member.

6. An electric storage battery according to claim 5, wherein:

said sliding member includes said thin flexible portion at an inner end of said sliding member;

said terminal portion being firmly and sealingly affixed to said cover member adjacent an inner end of said sleeve member.

7. An electric storage battery according to claim 1, 3 or 6, wherein:

said sliding member has a flange portion at said outer end for cooperating with an outer end of said sleeve member for preventing said terminal post from being moved in an inward direction.

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